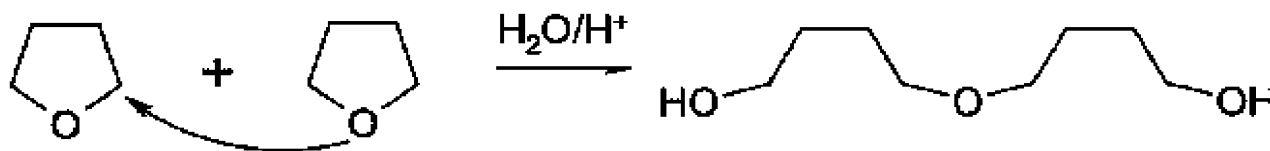


Remarks/Arguments:

This is a reply to the office action of November 9.

In claim 14 we have replaced the term "obtainable" by "obtained". A European decimal point has been corrected in claim 15. Claim 23 has been canceled.

The examiner objected to the term "poly-THF 2000" in claim 16. We respectfully submit that this is not used as a trademark. The examiner's attention is directed to the paragraph bridging pages 2 and 3 of the original specification, which describes the chemical formula of polyether polyol components used in the present application. One specific embodiment of such a polyether polyol is poly-THF. THF is a well-known abbreviation for the chemical compound tetrahydrofuran. This can be readily ascertained from a text book in chemistry, or by searching the patents for "THF". The skilled person is also readily aware of the polymer of tetrahydrofuran, i.e. polyTHF. Briefly, a number of THF molecules is reacted with each other to form a corresponding polymer:



This compound falls under the formula given on page 2 of the present specification. At the top of page 3, it is described that the number after poly-THF indicates the average molecular weight of the polymer. In other words, the term "poly-THF 2000" is not a trademark; it actually describes the chemical structure of the polymer: it is a polymer made from THF monomers, and the polymer has an average molecular weight of 2000. Thus, both the nature of the monomers as well as the number of the monomers in the polymer are specified. Furthermore, "THF" is not a federally

registered mark for polymers. Under these circumstances, we would respectfully submit that claim 16 can be maintained as it stands. As an alternative, claim 16 could be amended by replacing “poly-THF 2000” with “polytetrahydrofuran having an average molecular weight of about 2000”.

A terminal disclaimer over copending application 10/560607 is filed herewith to obviate the obviousness-type double patenting rejection.

The present invention involves a specific polyurethane resin, which is obtained by reacting specific components with each other: a specific diisocyanate (IPDI), optionally in the presence of other aliphatic diisocyanates, is reacted with a specific polyether polyol having an average molecular weight in the range of 1000 to less than 3000 g/mol.

Subsequently, the polymer chain obtained by reaction of the diisocyanate and the polyether polyol is extended by reacting the same with a diamine. Subsequently, in a third step the chain is further extended by reaction with a polyol having an average molecular weight of less than 800 g/mol. Finally, the reaction is terminated by a terminating agent which reacts with the terminal functional groups of said polymer. The invention is characterized not only by the use of very specific starting materials, but also by the sequence in which those starting materials are reacted with each other. It is obvious that the polymer looks different depending on whether the isocyanate is first reacted with the poly-ether polyol, or the diamine, or the low molecular weight polyol. The sequence in which the starting materials are reacted with each other determines the sequence in which the monomers are arranged in the polymer chain. If, for example, the diamine was first added to the diisocyanate, a reaction between the isocyanate groups and the amine groups of the diamine would occur. This would result in the formation of urea moieties. On the other hand, if one reacts the diisocyanate first

with a polyether polyol, as is done in the present invention, urethane moieties are formed.

Claim 14 of the present application clearly requires that the diisocyanates should be present in the reaction mixture in such an amount that there is no excess of the entirety of all the isocyanate-reactive components. This is a crucial feature of the present invention. As can already be gathered from page 5, last full paragraph, of the original specification, the presence of unreacted isocyanate-reactive components, in particular the presence of compounds having free amine groups, would adversely influence the characteristics of the final color ink.

In this respect, we submit a declaration of one of the inventors, Gilles Eisele.

Dr. Eisele has shown that if the final polyurethane comprises components having free amino groups, a yellowing of the final ink composition occurs. The present inventors have found out that this is due to a reaction of the most conventionally used carrier for color inks, i.e. nitrocellulose, with amines.

As Dr. Eisele indicates, the commonly used nitrocellulose varnish is colorless. If one adds the polyurethane resin of the present invention to said nitrocellulose varnish even in a ratio of 1:1, which is even more than used in example 2 of the present application, no yellowing of the resulting composition occurs. This is because the polyurethane resin of the present invention does not comprise unreacted isocyanate reactive components, especially no un-reacted amine components. According to the present invention, a monofunctional amine is used as a terminating agent, without any excess of said compound. For example, in the case of monoethanolamine, used in the example of the present specification as terminating agent, the resulting polymer has no free amino groups, since the amino group of the monoethanolamine is more reactive and will be converted. The final polymer is hydroxy-terminated.

On the other hand, Dr. Eisele has reproduced example 2 of WO 02/38643 (Arcurio et al.), which was cited by the examiner against the present application. In example 2 of the reference, IPDI, poly-THF 1000 and 1-4 butane diol are first reacted together with another diisocyanate (TDI-80). Only subsequently, in the extension step shown in table 4 on page 17 of said reference, an ethylene diamine is added. For this reason alone, the claimed invention is novel over the Arcurio et al. reference, as will be shown below. Significantly, in example 2 the diamine was added in an amount of 112% of the equivalents of un-reacted NCO groups. In other words, an excess of diamine was used in order to make sure that all isocyanate groups were reacted. The resulting polyurethane is amine-terminated, i.e. it has free amino groups.

This is in complete contrast to what is done in the present invention. As the experiment of Dr. Eisele shows, this has a significant effect on the final properties of the composition. As can be shown from the pictures in the declaration of Dr. Eisele, if one forms a mixture of the resin of example 2 of WO 02/38643 and the nitrocellulose varnish in a ratio of 1:1, a clear yellowing occurs. This is due to the fact that the product disclosed in WO 02/38643 comprises an excess of amine groups.

The claims previously presented were rejected under 35 USC §102 over three references (Blum, Eisele et al. and Arcurio et al.). Those references, which had been cited in the international proceedings as well as in the proceedings at the European Patent Office, were reported by Applicant. The international preliminary examination report was entirely favorable, and the European Patent Office has granted a corresponding patent.

To anticipate claim 21, a single reference must disclose the specific starting materials and the specific sequence and the feature that the isocyanate components and not the isocyanate-reactive components (in particular diamines) are added in an excess. None of the references cited by the examiner anticipates claim 21.

Starting with Blum (US 6,251,988 B1), applicant cannot agree that this reference anticipates claim 21.

As can be seen from column 1, lines 34 to 47, Blum is related to the problems involved with the use of an excess of isocyanate reactive components (in particular of the terminating agent). To solve this problem, Blum does not suggest the use of an excess of diisocyanate. At column 1, lines 64 to 67, Blum states: "thus, it has to be ensured that any excess amounts of stopper which are added do not impair the storageability of the solution and do not impair the properties of the coating."

In other words, Blum does not consider the possibility of using an excess of diisocyanate compounds; rather, he teaches one to use a very specific terminating agent (which he refers to as stopper). As can be gathered from column 2, lines 1 to 3, he believes that polyurethane solutions which incorporate amino-functional heterocyclic compounds as stoppers satisfy these requirements.

At column 6, first paragraph, Blum's stopper (terminating agent) is used in excess, preferably in an amount of 1.15 equivalents and more preferably in an amount of 1.3 equivalents per equivalent of isocyanate groups. In other words, the composition of Blum definitely comprises free amino groups, which stem from the use of an excess amount of the specific stopper agent. Blum therefore does certainly not fulfil the feature of claim 14 that the ratio of equivalent weights of diisocyanate to the group of isocyanate-reactive components is 1:1 or greater.

Moreover, as can be gathered from the process described in Blum on column 2, lines 28 to 42 as well as in claim 14, the sequence in which the various components are added is not identical with the sequence required by the present application. It can be seen that in step 1 a difunctional polyol, a polyisocyanate and a low molecular weight

component (such as a low molecular weight polyol) are added with each other. Only thereafter, in step 2 is a diamine added.

In contrast, the low molecular weight polyol is added in the present invention only in step c), i.e. after addition of the diamine. As has been explained above, this results in the formation of a different polymer.

The specific components of the present invention are somewhat comprised by the general teaching of Blum; however, it is respectfully submitted that Blum does not disclose the specific composition of the present invention. For example, in column 4, lines 62 to 63, Blum clearly describes aromatic diisocyanates as preferred. On the other hand, the present invention definitely requires aliphatic diisocyanates, as recited for example claim 14. Also, the limitation that the polyether polyol has an average molecular weight in the range of 1000 to less than 3000 g/mol is not derivable from Blum.

The examiner's reference to column 1, lines 17 to 23, of Blum concerning the equivalent ratio of approximately 1:1 was noted; however, this passage refers to the prior art and is not a teaching of the equivalent ratio used in Blum's invention itself. To the contrary, as shown above, Blum does not use this equivalent ratio.

Secondly, the examiner rejected claims 14-23 as anticipated by Eisele (EP 1 229 090), which is an earlier application of the same applicant and principal inventor. However, we submit that EP 1 229 090 does not anticipate because Eisele requires as a mandatory starting material a polyol having an average molecular weight above 10,000 g/mol. Such a component must not be used according to the present invention. Moreover, in EP 1 229 090 A1 the diamine is only added after all polyols including the low molecular weight polyol have been reacted with the isocyanate (e.g. claim 19 and 20 of EP 1 229 090 A1). It may also be noted that the equivalent weight ratios in

EP 1 229 090 are chosen such that essentially all of the isocyanate groups of the diisocyanate will react. In other words, EP 1 229 090 A1 does not use an excess of isocyanate in order to ensure complete conversion of all isocyanate reactive components. For this reason, claims 14 - 24 are novel over EP 1 229 090.

As a third reference with respect to novelty, the examiner cited Arcurio (WO 02/038643). However, in this reference also, the polyol components are reacted with the diisocyanate entirely before any diamine is added (see e.g. claim 1).

It is also noted that all the examples of WO 02/38643 (examples 1 to 3) clearly show that first a prepolymer of the polyols and the diisocyanate is formed, before an extension step with a diamine is carried out. As pointed out above, this leads to a clearly different polymer than is obtained according to the present invention.

Also with respect to WO 02/38643, there is no explicit teaching of the composition of the present invention. For example, the reference does not teach that only an aliphatic diisocyanate, one of which has to be IPDI, has to be used. It is also not disclosed that this specific diisocyanate has to be used in combination with a specific first polyol having a molecular weight between 1000 and 3000 g/mol, a diamine, and a polyol having an average molecular weight of equal or less than 800 g/mol. Applicant respectfully submits that the specific selection of starting materials according to the present invention is not derivable from WO 02/38643.

Claims 24 and 25 were rejected as obvious over the references in combination. The present invention is aiming at providing a specific binder resin which is suitable for the manufacturing of color inks. For said purpose, the resin has to fulfill several requirements such as adhesiveness, restorability etc. On the other hand, it has to be compatible with the conventional carrier for pigments used in color inks. This conventional carrier is nitrocellulose.

According to the present invention it was surprisingly found that the specific polyurethane resin as defined in claim 14 satisfies all these conditions. In this respect, we refer once again to the declaration of Dr. Eisele, which shows that the resin according to example 2 of WO 02/38643 is not satisfactory in this respect since it leads to a yellowing of the composition, something which must be avoided.

Applicant respectfully submits that there is no suggestion whatsoever in any of the three references cited by the examiner that the specific polyurethane resin as defined in claim 14 would be suitable for the formulation of color inks. We believe that the claims properly distinguish the invention from the prior art, and that this application is now in condition for allowance.

Respectfully submitted,

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